

PATENT APPL
IN-37

320450

NASA CASE NO. SSC-00008

TECHNICAL ABSTRACT

7-11

Hydraulic Lifting Device

This invention relates to a lifting device which is hydraulically operated. Specifically, the present invention pertains to a lifting device which is best utilized for raising and lowering toilet seats. Such a device will assist elderly and physically handicapped people with their personal care by helping the individual go from a sitting to a standing position and vice versa.

As shown in Figure 4, the lifting device consists of a cylinder 10, a piston 20, a bracket 30, a seal 36 (or 37), and a means for controlling fluid pressure. A chamber 41 is formed between the cylinder 10 and the piston 20.

Operation of the present invention is straight forward. The chamber is either pressurized to extend the piston or depressurized to retract the piston. Pressurization of the chamber is controlled by allowing a fluid, preferably water, under pressure to enter the chamber. This can be accomplished through the operation of a valve connected to an ordinary pressurized water line. The chamber is depressurized by allowing water to drain from the chamber. The water which is drained off from the chamber can be directed to a drain. With the piston extension connected to a toilet seat and the mounting bracket attached to a toilet frame, the present invention can raise and lower a toilet seat.

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Print Fig 4

(NASA-Case-SSC-00008-1) HYDRAULIC LIFTING
DEVICE Patent Application (NASA) 11 p
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Print Fig 4
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NASA Case No. SSC-00008-1

PATENT

HYDRAULIC LIFTING DEVICE

ORIGIN OF THE INVENTION

The invention described in this patent application was made
05 in the performance of work under a NASA contract and is
subject to the provisions of Section 305 of the National
Aeronautics and Space Act of 1958, Public Law 85-568 (72
Stat. 435; 42 U.S.C. 2457.

BACKGROUND OF THE INVENTION

10 Field of the Invention: This invention relates to a
lifting device which is hydraulically operated.
Specifically, the present invention pertains to a lifting
device which is best utilized for raising and lowering
toilet seats. Such a device will assist elderly and
15 physically handicapped people with their personal care by
helping the individual go from a sitting to a standing
position and vice versa.

Background Information: The use of a hydraulically
actuated piston inside of a cylinder to perform work is not
20 novel. Many types of hydraulically actuated piston and
cylinder assemblies, which operate under a variety of
conditions and environments, are commercially available.
However, these commercially available piston and cylinder
assemblies have one or more disadvantages associated with
25 them when applied to the particular application of
utilizing them for raising and lowering toilet seats for
the elderly and handicapped. These disadvantages consist
of (1) high purchase prices, (2) difficult and expensive
maintenance due to the fact that the assemblies utilize
30 petroleum-based hydraulic fluids, (3) and the assemblies
not being amenable to corrosive environments. The present

invention overcomes these disadvantages by providing a low cost, inexpensive-and-easy-to-maintain piston and cylinder system which can be used in a corrosive environment.

SUMMARY OF THE INVENTION

05 The present invention has the ability to perform small lifting tasks in a corrosive environment at a low cost and with a minimal amount of maintenance effort and expenditures. This lifting device comprises a piston and cylinder assembly which is actuated with locally available
10 water pressure.

An object of this invention is to provide lifting capability for a corrosive environment.

Another object of this invention is to provide lifting capability with a low initial cost.

15 Still another object of this invention is to provide lifting capability which will minimize initial cost and maintenance expenditures.

A further object of this invention is to provide lifting capability for a toilet seat which will help
20 elderly and handicapped people while transitioning between standing and sitting positions.

BRIEF DESCRIPTION OF THE DRAWINGS

Further details of the present invention are explained below with the help of the attached drawings in which:

25 FIGURES 1A and 1B represent a top view and an elevation view, respectively, of the cylinder belonging to this invention.

FIGURES 2A and 2B represent a top view and an elevation view, respectively, of the piston belonging to
30 this invention.

FIGURES 3A and 3B represent a top view and a sectional view, respectively, of the bracket belonging to this invention. FIGURE 3C represents a modified sectional view showing the relationship of the seal and retaining ring to
35 the bracket.

FIGURE 4 shows the invention in its fully assembled form.

DESCRIPTION OF THE PREFERRED EMBODIMENT

A preferred embodiment of the present invention
05 comprises a cylinder, a piston, a bracket, a seal, and a means for controlling fluid pressure.

Figures 1A and 1B show a cylinder 10 having an open
end 11 and a closed end 12. The closed end 12 can either
be an integral part of the cylinder 10 or be a separate end
10 cap 13. The cylinder 10 also has an interior surface 14
and an exterior surface 15. In addition, the cylinder 10
has an aperture 16 through which pressure regulated fluid
can enter the cylinder 10. The aperture 16 is located in
the closed end 12 of the cylinder 10, but this location is
15 not critical. A fitting 17 can be secured to the aperture
16 to facilitate the attachment of pressure lines to the
cylinder 10. Preferably, the cylinder 10 is made of
polyvinyl chloride (PVC). Specifically, the cylinder 10
can be constructed of three (3) inch diameter, Schedule 40,
20 PVC pipe with a three (3) inch diameter PVC end cap.

Figures 2A and 2B show a piston 20 having a piston
head 21 and a piston extension 22. The piston head 21
contains a groove 23. The groove 23 facilitates fluid flow
around the piston head 21 and, thus, ensures uninhibited
25 operation of the piston 20 within the cylinder 10.
Preferably, the piston 20 is made of PVC. Specifically,
the piston 20 can be constructed of two (2) inch diameter,
Schedule 40, PVC pipe with an extruded PVC end cap of a
diameter slightly less than the inside diameter of the
30 three (3) inch, Schedule 40, PVC pipe cylinder. The outer
wall portion of the piston extension 22 serves as a sealing
surface 24. Since the outer dimensions of PVC pipe are
manufactured to very close tolerances, the outside surface
of PVC pipe provides good sealing characteristics. The
35 piston extension 22 may also have an aperture 25 to
facilitate a connection to a device requiring movement;
e.g., a toilet seat.

Figures 3A and 3B show a bracket 30. The bracket 30 consists of an attachment ring 31 and a piston guide 32. The attachment ring 31 can be secured to the piston guide 32 by a variety of mechanisms such a bolt, a screw, a
05 clamp, etc. In the particular embodiment shown in Figures 3A and 3B, a bolt hole 33 is provided for securing the attachment ring 31 to the piston guide 32 with a bolt. A gasket 39 may be used between the attachment ring 31 and the piston guide 32 to prevent possible leakage in this
10 area. The gasket 39 is shown as an O-ring in Figures 3B and 3C. The bracket 30 is preferably made of extruded PVC. The piston guide 32 has a first gland 34 and may also have a second gland 35. Figure 3C shows how a first seal 36 and a retaining ring 38 are located relative to the
15 bracket 30. An optional second seal 37 is also shown. The first and second seals are O-rings, preferably in the form of U-cup seals.

Figure 4 shows an assembled version of the present invention. The piston 20 is slidably mounted within the
20 cylinder 10 whereby a chamber 41 is formed between the piston 20 and the interior surface 14 of the cylinder 10. The piston 20 extends through the open end 11 of cylinder 10 and through the bracket 30. The attachment ring 31 of bracket 30 can either be formed integrally with or fastened
25 to the exterior surface 15 of the open end 11 of cylinder 10. The piston guide 32 is secured to the attachment ring 31 with a bolt 42. The bolt 42 can also be used to secure the present invention to a stationary (relative to the cylinder 10) frame 43. The retaining ring 38 is used for
30 holding the piston 20 within the cylinder 10. The retaining ring 38 rests against the piston guide 32 and prevents the piston head 21 from traveling beyond the open end 11 of the cylinder 10. Situated in the first gland 34 of the piston guide 32 is the first seal 36. The first
35 seal 36 has the primary task of sealing chamber 41. The second seal 37 may also be used to serve as a back-up to the first seal 36.

As an alternative to the two-piece bracket (i.e., the attachment ring and the piston guide) described above, the bracket could be constructed as a single unit that performs the function of both holding and guiding the piston within
05 the cylinder. Thus, in this one-piece bracket, the attachment ring, the piston guide and the retaining ring would be constructed as one unit. In addition, however, a sealing surface would have to be incorporated into the bracket in order to seal the chamber.

10 Operation of the present invention is straight forward. When the chamber is unpressurized, the piston is fully retracted within the cylinder. In the retracted position, the piston is either restrained externally by the piston extension or by the piston head resting against the
15 closed end of the piston cylinder. When the chamber is pressurized, the piston moves to the fully extended position. In the fully extended position, the piston is either again restrained externally by the piston extension or by the piston head bearing against the retaining ring in
20 the bracket. Pressurization of the chamber is controlled by allowing a fluid, preferably water, under pressure to enter the chamber. This can be accomplished through the operation of a valve connected to an ordinary pressurized water line. The chamber is depressurized by allowing water
25 to drain from the chamber. The water which is drained off from the chamber can be directed to a drain. With the piston extension connected to a toilet seat and the mounting bracket attached to a toilet frame, the present invention can raise and lower a toilet seat to aid the
30 elderly and the physically handicapped in transitioning from a sitting position to a standing position and vice versa.

ABSTRACT OF THE DISCLOSURE

A piston and cylinder assembly constructed of polyvinyl chloride that uses local water pressure to perform small lifting tasks.

Figure 1A

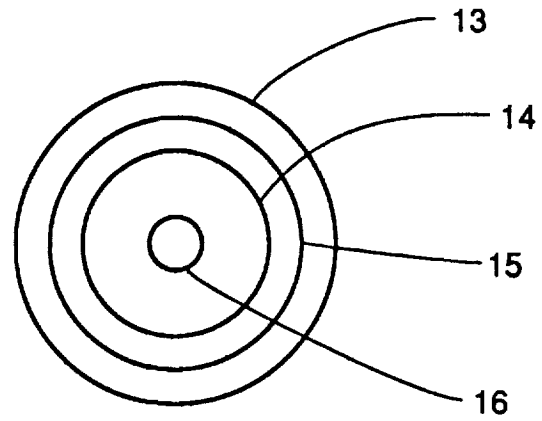
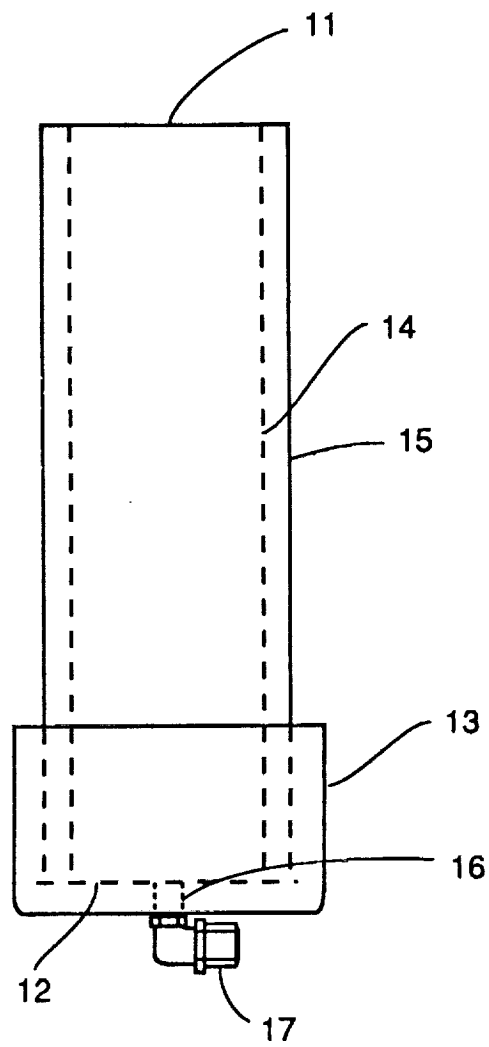


Figure 1B



← 10

Figure 2A

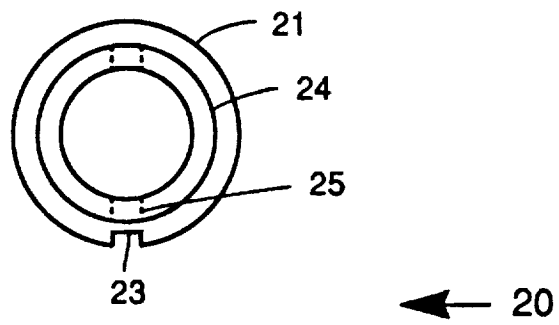


Figure 2B

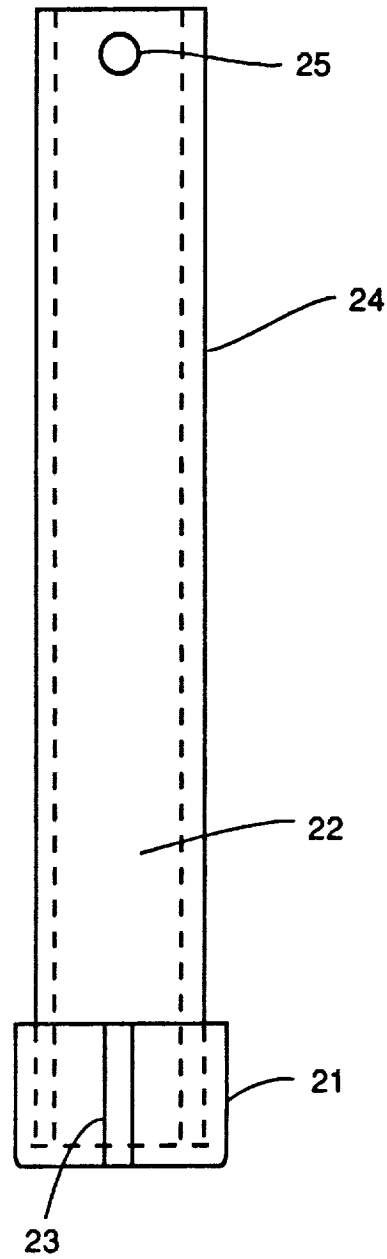


Figure 3A

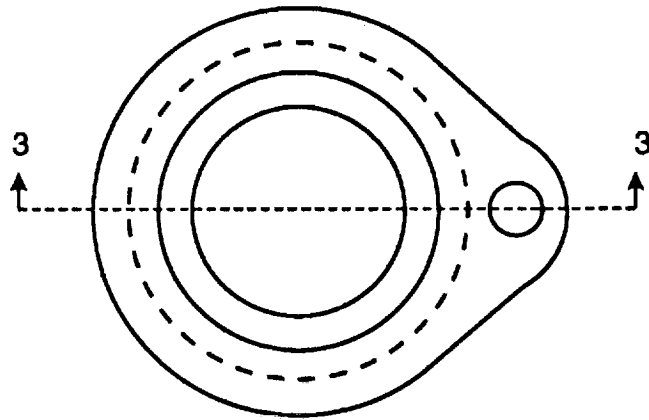


Figure 3B

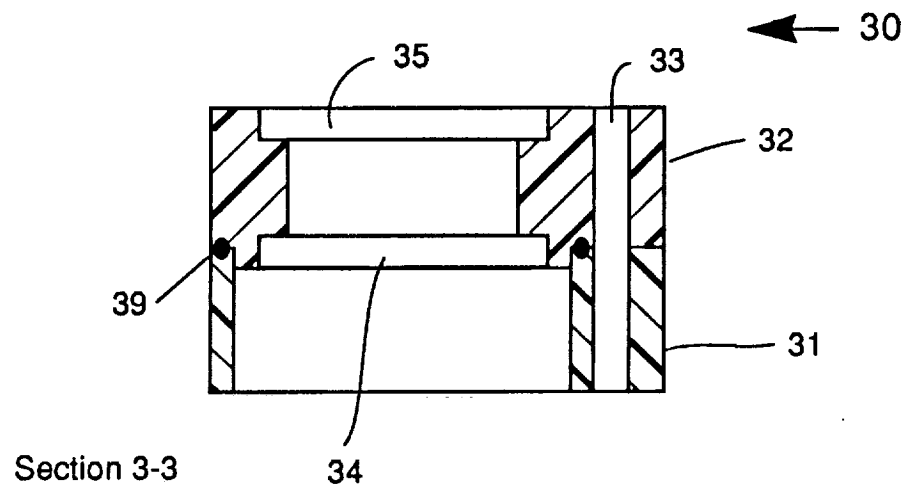


Figure 3C

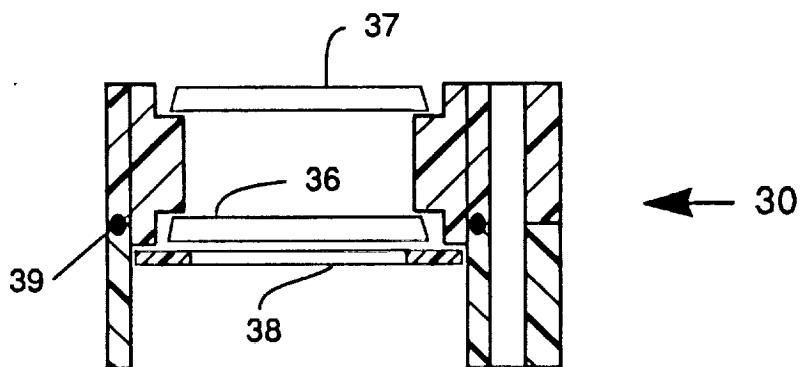


Figure 4

